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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/653,156	08/31/2000	Vishnu K. Agarwal	MI22-1518	4650
21567	7590	12/30/2003	EXAMINER	
WELLS ST. JOHN P.S. 601 W. FIRST AVENUE, SUITE 1300 SPOKANE, WA 99201			HUYNH, YENNHU B	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 12/30/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/653,156

Applicant(s)

AGARWAL ET AL.

Examiner

Yennhu B Huynh

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10/13/03.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15, 27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-7, 9, 10, 12, 14, 15, 27 and 28 is/are rejected.
- 7) ☒ Claim(s) 4, 8, 11 & 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

Art Unit: 2813

DETAILED ACTION

This Office Action is in response to the Amendment D filed on 10/13/03.

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/13/03 has been entered.

Currently, claims 1-15, 27 & 28 are pending.

Information Disclosure Statement

The information disclosure statement filed on 10/14/03 is being considered by the examiner.

Oath/Declaration

Oath/Declaration filed on 08/31/00 is acceptable.

Specification

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Art Unit: 2813

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-12, 27 & 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuzumi et al. (U.S. 6,222,722B1) in view of Tseng (U.S. 6,309,923).

Fukuzumi et al. at figs. 1-40 in related text cols. 1-20 disclose a storage capacitor having undulated lower electrode for a semiconductor device, which include:

-Re. claims 1, 2, 10, 14, 27 & 28: forming a first capacitor electrode 7 comprising titanium; the first electrode having an innermost surface area per unit area and an outermost surface area per unit area that are both greater than an outer surface area per unit area per unit area of one substrate, the innermost surface of the first electrode comprising a surface of the electrode that is firstly formed over the substrate, and the outermost surface of the electrode comprising a surface of the first electrode that is lastly formed over the substrate (fig.4 col. 7 lines 39-51). Fukuzumi et al. also disclose an opening 22 in an insulating layer 21, wherein the opening having sides defined by an exposed surface of the insulative layer and having abtoom defined by an exposed surface of the substrate (fig.18) forming a layer of polysilicon 23 over the sides and bottom of the opeing and annealing to convert the polysilicon layer to HSG, and the first electrode layer 24 is contact with the polysilicon HSG , and dielectric layer 26 and upper electrode layer 27 are formed on the first electrode layer 23A (figs, 18-22, cols. 11 & 12 lines 50-16).

Art Unit: 2813

However, Fukuzumi et al. do not disclose wherein the first electrode comprises/consisting/continuously layer of TiN.

Tseng at figs. 1-5 in related text cols. 1-6 disclose a method for forming a capacitor structure in DRAM, which include forming a lower electrode comprising /consisting/continuously layer of TiN (fig.9 col.4, lines 5-11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Fukuzumi et al. invention by incorporation a TiN lower electrode, to obtain a good electric characteristic and is not dense at a low temperature treatment, because the TiN material having chemically and thermodynamically very stable.

Fukuzumi et al. also disclose:

- Re. claim 3: forming rugged polysilicon 4 on the substrate and the first electrode layer 7 over the rugged polysilicon (fig.4)

- Re. claims 5,6 & 12: wherein the rugged polysilicon 4 comprises using a seed to form HSG spaced apart grains (fig. 3, col.7, lines 24-36).

- Re. claims 9 & 15: wherein the dielectric layer comprises Ta₂O₅ or ST (col.18, lines 14-17).

Fukuzumi et al. also do not disclose wherein the outermost surface area of the first electrode is at least 30% greater than the outer surface area of the substrate (cl.7).

- Re. claim 7: With respect to claim 6, the dimension, thickness or size of the grains is considered to involve routine optimization while has been held to be within the

Art Unit: 2813

level of ordinary skill in the art, As noted In re Aller 105 USPQ233, 255 (CCPA 1955). the selection of reaction parameters such as temperature and concentration would have been obvious.

"Normally, it is to expected that a change in temperature, or in range, concentration, cycles, thickness, would be an unpatentable modification. Under some circumstance, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

Allowable Subject Matter

Claims 4,8,11 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: The prior art do not disclose or suggest a method of enhanced surface area of capacitor, which include forming the rugged polysilicon is undoped (cl.4 &11); forming the first electrode comprises of chemisorbing a layer of a first precursor at least one monolayer thick over the substrate, and a second precursor at least one monolayer thick on the first precursor, wherein the chemisorption product of the first and second precursor layers being comprised by the first electrode (cl.8 & 13)

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

Art Unit: 2813

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu B Huynh whose telephone number is 703-308-6110 (and the new telephone number will be effected from 2/5/04). The examiner can normally be reached on 8.30AM-7.00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-7724.

Yennhu Huynh
Examiner
12/27/03

